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The Seybold Report

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The Scitex Response 300:

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Full-Color Electronic Page Assembly Arrives

THE SCITEX RESPONSE 300 system is a machine for electronically altering, combining and outputting very high resolution color images. It automates the labor-intensive processes of retouching, color separation, and stripping. Of several systems from different vendors, it was the first to reach the field. The first U.S. installation was in January 1980. At present there about thirty installations worldwide, about a dozen of which are in the U.S.

The Response 300 is a fascinating machine. A skilled operator can do amazing things to an image working with the color monitor and a special stylus for "pointing." At Print '80 in Chicago last spring, the Response 300 was a major attraction. One had to get reservations hours in advance to get to see a demonstration. This is unquestionably an exciting product and an exciting new area of pre-press technology.

Before looking at the Response 300 in detail, it is interesting to reflect on the significance of this type of product from the perspective of the underlying computer technology. For the most part, we are accustomed to thinking of progress in the computer field as being a steady progression toward ever more processing power and storage for a given cost. But if one considers what applications are practical for computers to handle, the progress appears anything but smooth. As a certain level of capacity is reached, an impractical application area is suddenly practical.

Consider the question of how much random-access memory each user of a system needs. If the system is involved in conventional data processing, each operator is probably only dealing with records of a few hundred bytes. Systems of this sort were the first to cross the threshold of practicality. If full-screen, scrolling text editing is required, it becomes necessary to allocate several thousand bytes to each user. This did not become practical until the mid-1970's. And only now has technology reached the point where it becomes practical to provide hundreds of thousands of bytes per user, which is the amount necessary in a system like Scitex's. Disk resources have grown in parallel with memory. The Scitex system represents the latest step in this growth, too: it is essentially a single-user system with nearly a billion bytes of disk memory.

HIGHLIGHTS IN THE NEWS

Kurzweil has introduced a faster, smarter model of its KDEM, which has resulted in a threefold improvement in throughput. More details are on page 15.

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Electronic Information Technology is now offering a Winchester disk configuration of its COMAP system, in either 12.5-MB or 25-MB versions. See page 15.

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Compugraphic has suffered another disappointing quarter—and will not pay its regular quarterly dividend. Financial news from CG and Harris is on page 16.

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Electronic Manipulation of Color Imagery

The Response 300 System from Scitex

Color console of the Response 300 system. *The operator is working with the image from one of the six small transparencies seen at left. Over his right shoulder is a rough of the page he is putting together. The system allows him to perform a variety of color correction, retouching, and image assembly functions.*

Pre-press electronic handling of color images is a new field, but one which is growing rapidly. The Scitex Response 300 system, reviewed here, is only the latest step in a series of steps automating the process of producing full-color images on paper. There is a direct parallel with typesetting: like typesetting, color separation has moved from being a photographic process to being an electronic one; and also like typesetting, color separation equipment is expanding toward the output of full pages instead of pieces to be assembled by hand. In fact, a convergence of the two activities (typesetting and color separation) is starting to take place. (We'll return to this convergence at the end of the article.)

The hand assembly of color images—the "stripping" process—is a terribly exacting, labor-intensive (and therefore expensive) process. It is a much more demanding activity than black-and-white paste-up. Elimination of the stripping step in color work would save a great deal of money whereas elimination of black-and-white paste-up would not. This is an important point, because the cost-justification of a system like the one reviewed here depends heavily upon avoiding stripping and its costs.

Given the potential savings, why was electronic color image assembly not developed earlier? The key problem was that the necessary technology was not available. Working with full-color images at the resolution needed for high-quality reproduction requires vast storage (almost 40 million bytes for an 8½" by 11" page on the Scitex system) and processing speeds higher than those available on general-purpose computers. Indeed, although electronic color image handling is now practical, response times for some activities are (and will continue to be) limited by the technical problems of handling the masses of data involved.

Conventional color separation. The Response 300 is intended to produce high-quality color separations. The functions it seeks to automate are: color separation, stripping, retouching and color correction. These functions differ substantially from the corresponding steps in black-and-white printing. Since these functions are typically performed by specialized separation and retouching shops, they may not be familiar to some *Seybold* the Scitex approach, we'll start by describing the conventional one, using as an example a full-page automobile ad destined to run in a magazine.

Our ad will contain two photos (full color), some type, and the manufacturer's logo (also color, but composed of flat tints rather than continuous-tone color). An ad agency is coordinating the production of the ad. The photos involve the use of a private home as a backdrop. The necessary arrangements are made and the automobile and the photographer are dispatched to the site. Several days later, transparencies come back from the photographer. In the meantime, type is being set at a type shop specializing in ad work.

There is a problem with one of the transparencies, as it turns out: the car which was photographed was not the right color. In addition, there is a bush in the foreground which diverts attention away from the car. The offending photo is sent off to a retoucher for some careful airbrush work.

While this is happening, the ad agency is putting together a "mechanical." The mechanical consists of the type and any other line work pasted up on a stiff board. There is a tissue overlay indicating placement of continuous-tone art and giving other special instructions.

When the retoucher is finished, the photos and the mechanical are sent to the color separator. Color separation may be done photographically or electronically using a color separation scanner. In either case, the end result is a set of four negatives which will be used to produce the four printing plates used in process color printing. In high-quality work, each image is separated independently, so the two photos in our ad yield four pieces of film. The logo involves only flat tints. To produce these, line shots are made from the mechanical and sandwiched with standard tint screens. Four negatives for the logo are produced in this way.

All of these pieces of film, plus a line shot of the mechanical, are then combined into four flats or page negatives in the stripping process. Registration is absolutely critical here, since even minute registration errors will produce *moire* patterns and/or poor color reproduction on the press. At this point, a color proof is made. The proof is sent to the ad agency, which then approves it or presents it to the client for approval. Any prob-

of time, material, and money to correct. If everything is satisfactory, the page negatives and the proof are sent to the magazine's printer for platemaking and printing.

Color correction. An important part of the color separation process is color correction. Color correction is an inherent and inevitable part of color separation. If color printing could reproduce the full tonal range of color photographs, then color correction might not be necessary in some cases. However, printing cannot fully reproduce photographic color and this means that some compromises have to be made. The simplest thing to do is simply to compress the tonal range of the photo equally throughout the color space. However, this approach can lead to the loss of important detail. For example, shadow tones might be pushed together to the extent that detail which was evident in the photo is imperceptable in the printed version. Examples of this sort lead to the conclusion that it is desirable to be able to choose in what part or parts of the tonal range compression is to take place. The choice would obviously differ depending on the nature of the subject matter and the colors present. A further complication is that the range of colors which are visually acceptable for skin, grass, and sky is quite limited, and if the art being separated includes these (or similar familiar colors) adjustments have to be made in such a way that they are acceptably reproduced. Another factor which has to be addressed in the separation process is the limitations of color inks. Although good yellow inks can be produced, existing cyan and magenta inks fall far short of the goal of being "pure" cyan or magenta. This has to be compensated for at the color correction step. Finally, a photo which has been poorly exposed will sometimes have an overall color cast to it, and this could be compensated for during color separation as well.

Two other processes which are generally considered part of color separation are edge enhancement and undercolor removal. Edge enhancement (also called "unsharp masking") improves the appearance of four-color printing. Undercolor removal helps alleviate ink-related problems on the press. It also saves ink. Basically, it involves substituting black ink for part of the colored ink in those image areas where yellow, cyan, and magenta are all present.

To go into the details of the correction process would require more space than we have here. The interested reader could start with *The Pocket Guide to Color Reproduction* by Miles Southworth. It's available from: Graphic Arts Research Center, Rochester Institute of Technology, One Lomb Memorial Drive, Rochester, NY 14623. Suffice it to say that it is a complex process involving quite a bit of subjective judgment on the part of the separator.

The Scitex Response 300

Now let's take a look at the same ad as it would be handled on a Scitex system. The starting point is the continuous-tone art and a mechanical with type in place.

Scanning

Scitex doesn't make a scanner, but it will interface a user's system to the scanner of their choice. The image data from the scanner is passed along to the Scitex system, where it is stored on disk. The Scitex user does not use the scanner's output capability: all output is done on the Scitex laser plotter.

Color separation scanners have the ability to correct for color deficiencies in the material being scanned. As noted above, the correction can take a number of forms, depending on the requirements of the original art. When scanning art for the Scitex, the user makes the same kinds of corrections as in conventional scanning. If it turns out that further correction is desirable after the material is on disk, the correction can still be done at the Scitex color workstation.

A number of pieces of art, intended for the same or different jobs, could be scanned together, but for highest quality each individual element is usually scanned separately. This allows the scanner to be adjusted to the particular needs of each piece of art. On the other hand, for less critical work scanning a number of items together saves time. They can subsequently be separated at the color console.

Line art is generally scanned separately from continuous-tone art, since the resolution requirements are different. Continuous-tone art, if it is to be reproduced at the same size as it is scanned, requires scanning at around 300 lines to the inch. There is no point going to higher resolutions since the output will be screened at, say, 133 or 150 lines to the inch and any details finer than this would be lost.

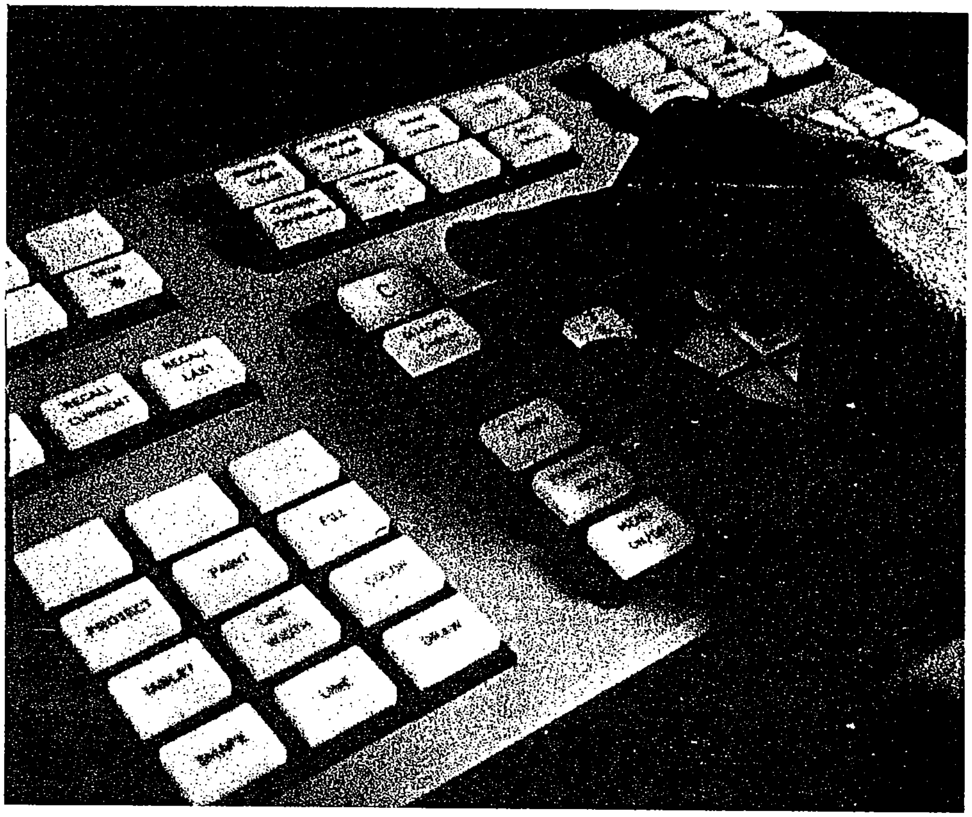
The scanning requirements for line work are more severe. If line art is scanned at less than about 1000 lines per inch, artifacts of the scanning process are visible in the output, particularly in type and in cartoon-type drawings. It would be possible to scan both line and continuous art at 1000 lines per inch, but this would increase disk storage requirements by an order of magnitude and slow down many system functions to a similar degree. In conventional processing, this type of consideration does not arise: line art is not scanned, but is photographed on a separate negative. The separated and screened continuous-tone material is then combined with the line material in the stripping process prior to platemaking. In cases where the type or other line work is free-standing (*i.e.*, not touching the continuous-tone image) the same procedure can be used with the Scitex system. The line work can be on a separate negative which is combined with the material output by the Scitex system. Scanning of the line work is then avoided (at the expense of some extra labor and film).

The color console

The key to the efficiency of the Scitex system, and also its most intuitively appealing part, is the "color console," the system's image manipulation and display station. It is the capabilities of the color console which draw capacity crowds at shows where the system is demonstrated, and it is on the basis of these same capabilities that Scitex justifies the system's high price tag.

Scitex aims to give the console operator all the tools needed to take the individual, unretouched elements of continuous-tone

Color console. *The CRT display is at the center. To the left is the transparency viewing area, and to the right, the area for opaque art. Below the screen are color adjustment slide bars and switches. In front of these is the stylus and its special tablet. To the left of the tablet is the function box. The VDT at the right is for interaction with the minicomputer (not shown).*



Function box. *This keyboard allows the operator to select among the various functions of the color console.*

art and meld them into a page which is complete, harmonious, and faithful to the mechanical. This process involves a variety of activities which would be handled separately in the conventional process: color correction, retouching, ruling, stripping, etc. The operator works with a stylus and digitizing tablet (for pointing and outlining), a set of four sliding color bars (for color mixing), a thumbwheel (for color correction adjustments), and a viewing box for opaque or transparent originals (for comparison with the screen image). There is also a "function box" (a keyboard with pushbuttons for the most commonly-used functions of the color console) and a conventional VDT for typing commands to the minicomputer which is in charge of the color console. Let's take a look at how these would be used in putting together our hypothetical car ad.

The elements of the ad are input into the system via a scanner. Typically, the elements of a job are scanned individually. In some cases, though, if several photos are taken under the same conditions they can be scanned together. In that case, the operator's first job is to break up the scanned material into individual art elements. The scanned material is called onto the screen, and the operator indicates with the stylus (whose movements are shown as a small crosshair cursor on the screen) two diagonally opposite corners of an item. The system responds by drawing a frame around the item, and the operator types in the name of the selected item so that it can be referred to again later in the process. In this fashion, the operator names all the items that will make up the ad.

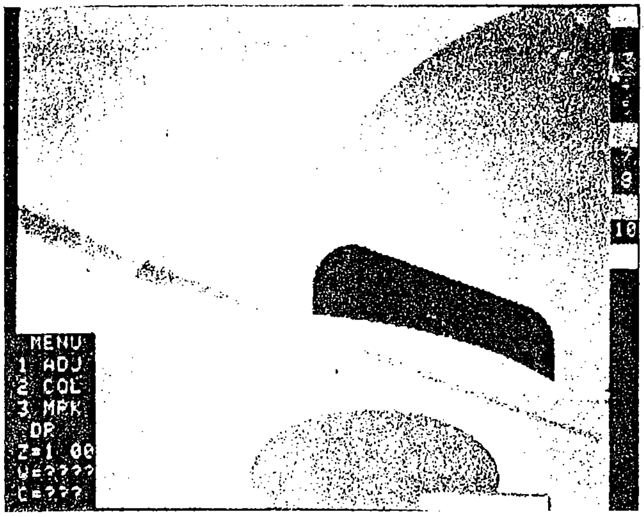
Next, each item is called up individually for color adjustment and retouching. Color adjustments to the whole image would be made first. Such adjustments would be needed if the scanner had not been set up quite right. (Major scanner misadjustments would necessitate rescanning.)

A variety of color adjustments are provided for. Highlights, shadows, or midtones can be adjusted either for a specific separation color or for all simultaneously. Contrast can be increased

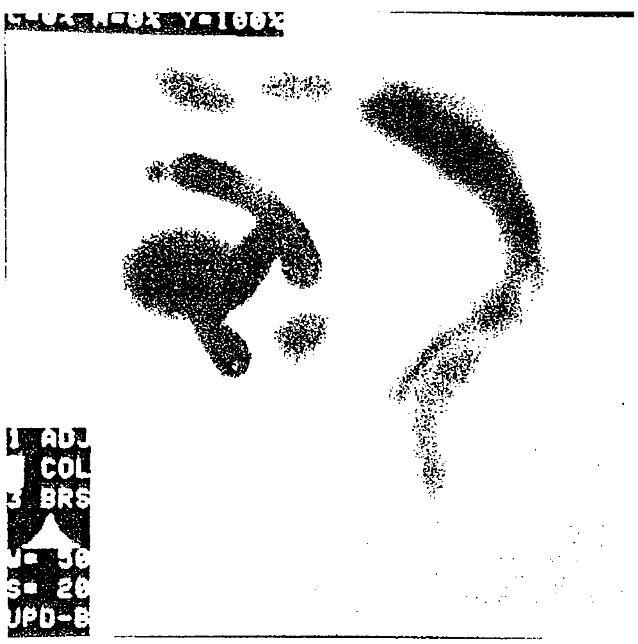
The operator sees the results immediately in the screen image. The tonal curves for the four separations can be superimposed on the image if desired. Each individual separation can be displayed, either in its true color (*i.e.*, yellow, cyan, magenta) or in black-and-white (as with standard separation negatives).

After the overall color settings are right, the operator proceeds with local changes to the image. By outlining an area with the stylus, the operator can apply any of the color adjustments listed above to just that area. For our ad, the operator outlines the car whose color is to be changed. The outlines have to be accurate so that no background colors are inadvertently affected, so the operator zooms in until the car fills most of the screen. Now the outline is carefully traced with the stylus, and the operator zooms back so that the whole picture is once more displayed, and color adjustments are made again. The operator can use any of the color manipulation techniques mentioned above, but this time only the outlined area (*i.e.*, the car) is affected. When the color of the car is satisfactory, the operator turns to the problem of removing the bush.

The bush is removed by electronic airbrushing, and the procedure is almost exactly the same as with a real airbrush. The operator chooses a color, either via the color slide bars or (more commonly) by pointing the stylus at a spot on the screen where the desired color already exists. The color can then be applied by moving the cursor across the relevant picture areas. The slower the movement, the thicker the color, just as with a real airbrush. The operator can specify brush diameter. There are three choices of brush cross-section (how fast the color tapers off from the center). The speed at which the electronic "pigment" is laid down can be selected too. Very subtle effects are possible using this technique—perhaps even subtler than with conventional airbrushing, since the operator can work with a greatly magnified version of the image if need be. Image areas which are to be protected from airbrushing can be outlined with the stylus. If a mistake is made, the airbrushing can be "for-



Automatic shape generation. *Using the stylus to indicate location and the function box for color and size information, a variety of shapes (including rectangles, circles, ovals and polygons) can be generated automatically. The shapes can be drawn as frames around other art (with the rule thickness being specified by the operator) or they can be filled in with solid color.*



Airbrush effects. *The operator can use the stylus as an airbrush for retouching purposes. "Pigment" density, rate of flow, and side-to-side dispersion are under operator control.*

Line art and type are less likely than continuous-tone art to require much modification, but there are a number of things which the operator might do with them. Broken type can be fixed and hand-drawn rules can be replaced by machine-drawn ones. The operator can specify the colors of these items (if other than black), and they can be compressed or shrunk in either dimension (this can be done to continuous-tone art as well).

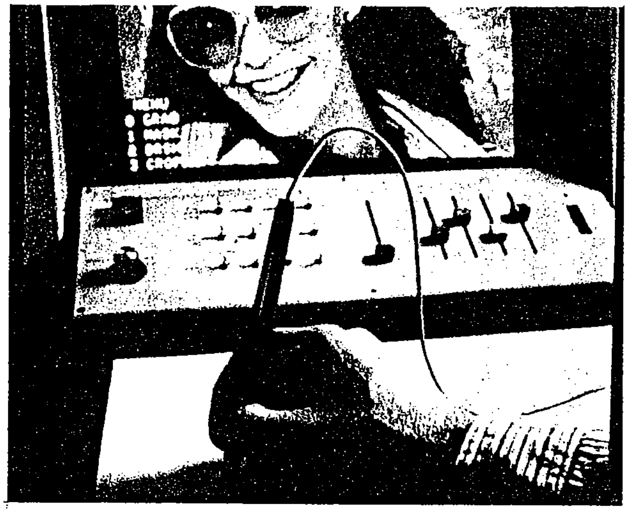
When all the individual elements have been corrected, the page is ready to be assembled. This process, which is simple and straightforward in appearance, is actually where the Scitex system really earns its keep. We will have more to say about the economies involved under "cost justification." The procedure is typically something like this:

First the page space is defined. It can be a simple rectangle or a standard grid which the system stores. The line art and type are called to the screen and positioned according to the layout. Then the continuous-tone work is called out and positioned. Positioning is accomplished via cursor movements. For material in which relatively few elements are combined, such as our car ad, these facilities may be all that is needed.

For more complicated work, such as catalog pages where many items of both line and continuous-tone art can be present, the Scitex system provides additional facilities. Items can be rotated if the orientation in which they were scanned is not right, although this is very slow for images of significant size. One of the slickest capabilities that the system has is a method of superimposing one piece of continuous tone art on another. It works like this: The operator works first with the item which will be superimposed. It should be on a background whose hues contrast with those of the foreground item. The operator points the cursor at any point on the background and tells the system

Tone curve display. *Superimposed on the image being operated on are tone curves showing graphically how each of the four process colors in the image has been corrected at this stage.*

Split-screen display. *Two versions of the same image can be viewed together using the system's split-screen capability. This is helpful during color correction.*



Stylus and color controls. *Movements of the stylus (foreground) cause movements of the crosshair cursor. Colors can be selectively produced and adjusted by movements of the slide bars (right). The switches (left) permit choices about how to display the image on the screen.*

to remove the color. All points in the image with precisely that color turn white. (The operator can outline and operate on a smaller area if the entire image is not needed.) Given that the whole background is unlikely to be of the identical color, some background areas will remain. ("Identical" in this context means that all 32 bits of color data are the same.) To remove the remaining background areas, the operator points at any remaining spot and tells the system to remove that color as well. By repeating this process as many times as necessary, the background is effectively erased. The item can now be positioned on top of another image, and everywhere the background was removed, the underlying image shows through. This technique is very handy for complicated items (e.g., a wrought-iron fence) for which any alteration of the background by conventional means would be extremely difficult. There is a significant limitation, though: the background and the foreground item must not have colors in common.

Using the techniques outlined above, plus a number of others (generation of frames and solid areas of various shapes, generation of tints, patterns, degradés) the operator puts together the complete page. When it is complete, the finished page is stored on disk in preparation for the output step.

Output

The output of a finished page is a two-step process. The second step is the actual output on the Scitex laser plotter, but before this can happen the material selected for the page has to go through a final electronic processing step. This pre-exposure processing merges the data from the files representing the individual art elements into one large file. This processing can be fairly time-consuming, so some users may opt for an extra CPU just to handle this chore. (Nashville Electragraphics, the Scitex installation which we visited, has purchased a CPU for this purpose.)

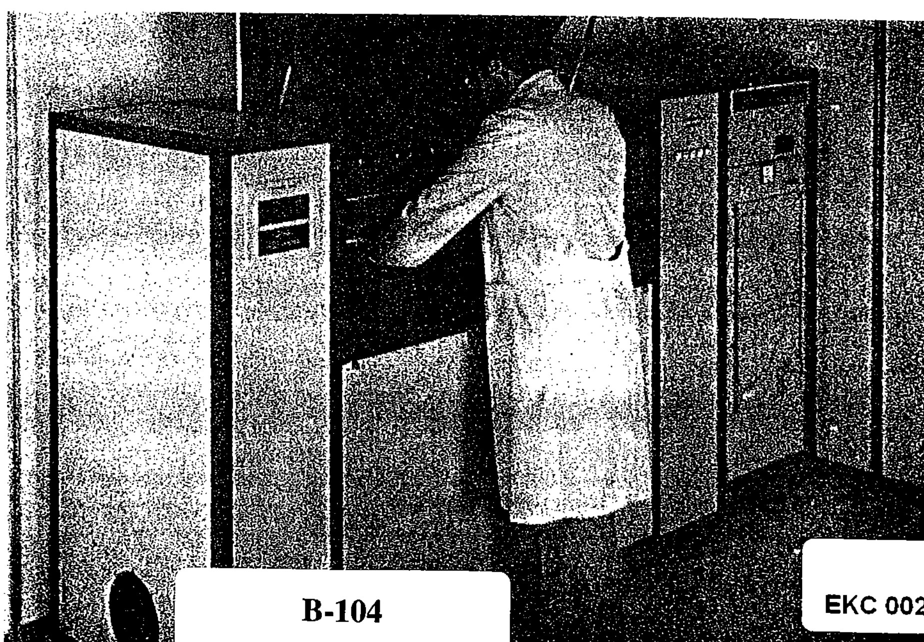
Then comes the final step: exposure of the image on the laser plotter or engraving of the gravure cylinder. Half-tone dots (at operator-specified screen angles and spacing) are generated on the fly during this process. Dot shape can be square, round, or elliptical at the operator's discretion. Maximum output size is 34" x 48" (86.5cm. x 122cm.). The laser plotter is a remarkable device, combining exceptional accuracy with a large format. We'll return to it later.

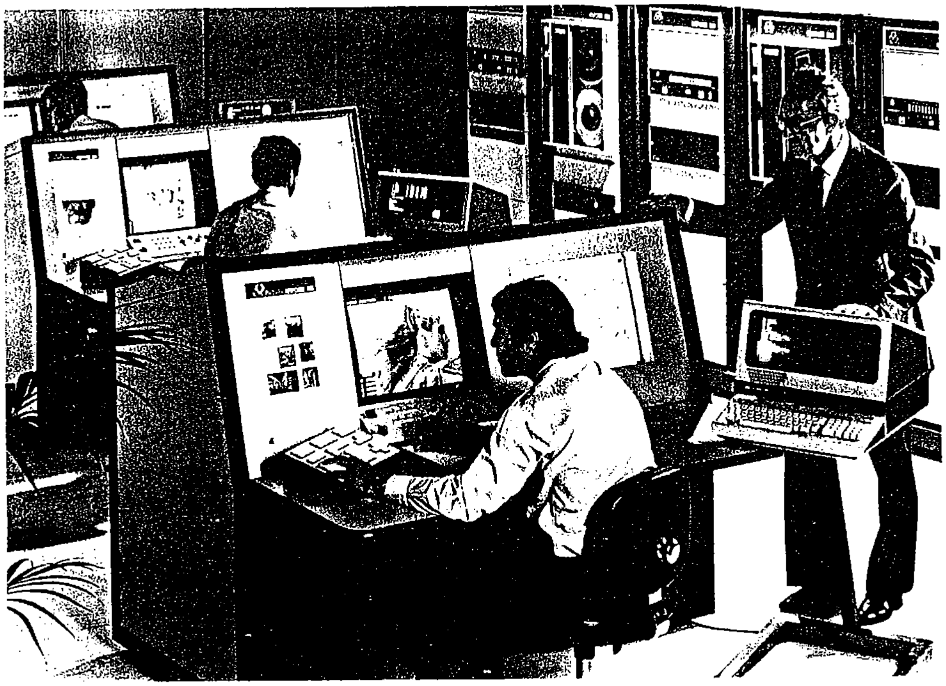
The technology

As we indicated in our introduction, the amount of data involved in dealing with high-quality color images in digital form is staggering. It is only in the last few years that the technology has been available to work with images interactively, and there have been few attempts to deal with images at the level of detail that Scitex does. Even a jaded observer of the computer scene, used to rapid escalations of storage capacity and processing power, would have to be impressed with the amount of hardware involved in what is essentially a one-user system.

The basic architecture of the system reflects the three-fold nature of the system's task. First, there is the data coming in from the scanning process. This must be collected and stored away for subsequent use. Then there is the manipulation of images at the color console. And finally, there is the output of

Laser plotter. *This is the system's output device. It contains a large drum on which the output film is mounted.*





A large Response 300 installation with three color consoles. *In the background are three CPU's and 2 tape drives. Barely visible beyond the last CPU are the tops of two disk units. There is a lot of computer power in a Scitex installation. The purchaser needs to plan carefully to provide adequate clean, uninterrupted electrical power and appropriate air conditioning.*

the finished image on the laser plotter. For each of the three steps, there is a dedicated computer. Each computer is a Hewlett-Packard 21MXE 16-bit minicomputer with 262KB of memory. Each has a disk drive with 240MB of disk storage. (To give a bit of perspective, this set of computers has the processing power to handle dozens of conventional text-editing terminals. The disk capacity would be sufficient for an editorial system of a hundred terminals.)

But for the image-handling application, this array of equipment is about the minimum Scitex could use. First, consider the amount of disk storage. The typical resolution at which continuous-tone work is scanned is 300 dots to the inch. A typical page is around 100 square inches; that works out to about 9 million dots. (In the image-processing field, the dots are referred to as "picture elements," or "pixels" for short.) For each pixel, the system stores eight bits of information about the level of each of the four process colors—32 bits in all. That means that it takes about 300 million bits (38 million bytes) to store such a color image. On a 240-MB disk pack such as Scitex uses, you can only fit six such pictures (seven if some aren't quite full size)! The entire system can only accommodate about 20 page-size pictures in various stages of the operation.

Please note that we are talking about pages which are edge-to-edge continuous-tone art. In actual practice, such pages will be the exception. Most pages will also contain line art, which occupies far less space on disk. Talking about full-page images, as we have been doing, is useful for purposes of comparison; but as a practical matter, the number of pages that are actually stored in a given space will be several times greater than the numbers mentioned above.

The disk drives also place a speed limit on some operations. Data can be read from them at a maximum rate of a couple of million bytes per second, so any command requiring the reading of a full-page image from disk can require quite a few seconds to execute. Faster disk drives wouldn't help much, either. The computers themselves aren't capable of transferring data at significantly higher rates.

The point of this little exercise in numbers is that color images of graphic arts quality require a great deal of storage, and just moving them around in a reasonable amount of time requires a great deal of processing power. (The reader who ponders such matters may wish to consider what all this says about the human visual system, which performs much more sophisticated image processing than a system like this.)

Still more impressive in some respects is the processor inside the color console. This processor, which Scitex makes, handles the manipulation of images on the screen. The color console receives data from the minicomputer only when a new image is required or when a change of image scale is requested. It sends data to the minicomputer only when the operator asks for an image to be saved or output. During image manipulation, it functions autonomously.

The screen image on the console does not normally show the full detail present in a scanned image. The number of points displayed is limited to 320 horizontally and 256 vertically. Thus, at normal enlargements, each screen point represents an "average" of many points stored on disk. But there is a remarkable amount of computing going on behind the scenes in the console. The image on the screen is refreshed sixty times a second, and for each refresh cycle the color values at all 80,000-odd points are recomputed. Operator activities such as cropping, color correction, airbrushing, etc. are all handled as modifications of this ongoing computational activity. The console factors these modifications into the image between screen refreshes, so that when the next sixtieth of a second rolls around, the change is incorporated. From the observer's point of view, this is an instantaneous response.

The output plotter, though perhaps a little less exotic, is itself a remarkable device. It combines a large exposure area (34" by 48") with very high resolution (up to 1824 lines to the inch) and high accuracy (a thousandth of an inch over the

Color sample on opposite page

This insert was provided by Nashville Electragraphics to illustrate the capabilities of the Response 300. It shows how the color of a flower can be changed with no loss of detail and without disturbing other elements in the image.

Scitex in the Field: A Visit to Nashville Electragraphics

Nashville Electragraphics Company is a supplier of high-quality color separations. Clients include most of the major magazine publishers (for whom NEC does covers), as well as record companies (album covers), book publishers and ad agencies. NEC had one of the first Scitex installations in the U.S. (11 months old when we visited) and we went hoping to find out exactly how a Scitex system fits into the procedures and workflow of a diversified color separation operation. We went to Nashville with the naive expectation that, after almost a year, NEC would have settled into standard patterns of use and we would be able to pinpoint those factors in the Scitex approach which offered greatest benefit in the production environment.

Alas, it wasn't so simple. The Response 300 is complex enough, and it causes enough changes in the pre-press process, that a clear reading on just how best to use it is difficult to obtain. For many types of work, it is apparent that a better job (in terms of the image quality of the printed piece) can be done on the Scitex than by conventional means. What is not clear, though, is in what circumstances using the Scitex makes economic sense. Many image improvements which are all but impossible by conventional means are done readily on the Scitex, but at the cost of operator time and system throughput. The Scitex user (and, ultimately, his customer) is thus faced with a trade-off between quality and efficiency (*i.e.*, cost). This is a sticky issue which we discuss at more length elsewhere.

At any rate, we didn't find easy answers to these questions. NEC's president, Roy Luckett, believes the first step in addressing them is the appointment of a person who knows the capabilities of both the Scitex equipment and the conventional equipment as "systems manager." This person would make sure that jobs coming into the Scitex were appropriately handled by it, rather than by conventional means. Thus, as experience is gained in the efficient use of the Scitex, the systems manager can apply this experience to this incoming job stream, selecting only the most appropriate material.

Luckett was able to give us many insights into the efficient use of the system, and to explain its advantages for various types of work. At present, NEC runs about 5 to 8 percent of its work on the Scitex system. (There are also four Hell scanners for electronic separation as well as camera facilities for photographic separation.) The Scitex is not profitable yet, Luckett says, although he can see now that it ultimately will be. More training and experience throughout the organization will be needed to achieve profitability. Luckett has set as a goal a system throughput of an hour and a half per page, compared with the present rate of a page every three or four hours. The system is run on a three-shift basis. The skill of the operator at the color console is the primary limit on system throughput. A secondary limit had been the laser plotter, but Luckett expects this to be cured by a new Scitex software release which doubles plotter speed.

NEC has been very happy with Scitex's training and support. NEC's operators went through an intensive five-week on-site training program which Luckett likens to getting both a bachelor's and master's degree in five weeks. This gave them familiarity with all the features of the equipment, but they are still in the process of learning the most efficient ways of using the system. NEC opted for the Scitex service agreement. The price—9% of the purchase price per year—seemed awfully high at first. (Recalling his feelings when he first found out about it, Luckett says, "When I got back up off the floor, I asked them if there wasn't some mistake.") Now, though, he feels it was a good investment. During the first three months, the installation was plagued with electrical problems, necessitating many visits by Scitex field service personnel. Scitex always responded promptly to calls—twenty hours was NEC's longest wait. There have also been thirteen software updates since NEC's system was installed, and all thirteen have been provided free under the maintenance agreement.

The Scitex system has meant much publicity for NEC, and a good many new jobs are coming in from clients who would not have sent their work to NEC previously. Some jobs have even come in which were expressly designed for the Scitex and could not have been handled any other way.

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whole image area). These attributes make it an attractive output device, not only for the graphic arts, but also for areas like circuit board design and remote sensing where large format and/or high resolution are important. It would also be quite suitable as the output mechanism for a typesetter, a fact which has not escaped Scitex's attention. In its role in the Scitex system, the laser plotter uses special processing circuits to generate half-tone dots "on the fly" as the data is received from the minicomputer. With a special option, it can also produce continuous-tone separations for use in producing gravure cylinders via

EKC 002002509

Pricing and cost-justification

The Scitex Response 300 system is expensive. The basic system cost is $825,000. This price does *not* include a color-separation scanner, which is required as the basic input device and which would add several hundred thousand dollars to the overall system cost. (Most prospective Scitex customers would already have a scanner.) The price does include an interface to the scanner of your choice, as well as the standard hardware configuration: three CPU's, three disk drives of 240MB each,

B-106

plotter. Installation, training, and a 90-day warranty are also included. Just about every customer will opt for the service contract, which costs 9% of the purchase price per year. Software updates are included with the service contract.

The system can be expanded. If you find your system has a bottleneck at the pre-plotter processing stage, you can add an extra CPU to handle that task for $125,000. An extra color console with CPU and disk drive sells for (are you ready?) $400,000. The continuous-tone output option (for gravure) costs $25,000.

Can it pay for itself? It should be clear by now that the number of potential customers for a Scitex system is not great. But how big does an operation need to be before it can consider such a system? Calculating the costs associated with buying and running a Scitex system is relatively straightforward. Calculating the savings over conventional techniques is not, however. Scitex has come up with some numbers that it considers "typical," and those are the basis of the following discussion. For purposes of these calculations, we assume that none of the Scitex system's special facilities (airbrushing, dropping out of background, etc.) are being used and that the system is simply being used for color correction and image assembly. (The inclusion of the special features in the analysis would complicate matters still further, since they are so easy to invoke on the Scitex that they might be used in cases where their conventional counterparts would be impractical.)

Greatly simplified, the argument for the system goes as follows. Scitex estimates that the labor involved in dot etching, contacting, and stripping of color separations by conventional means comes to about 7 hours in the case of the typical page. (Scitex bases its calculations on a "typical page" consisting of three continuous-tone images plus some line work.) The same page, according to Scitex, takes about 2 hours of labor (including scanner operation, color console operation, and supervision) on the Response 300. The savings of 5 hours translates into $75, given a wage of $15 per hour. Materials are saved too: Scitex figures 32 pieces of film are typically used to obtain the finished page via conventional methods, but only 5 are needed using the Response 300. The savings here amount to about $50 per page. The total saving is then about $125 per page. (Our conversations with users indicate that this degree of savings is a realistic goal, given enough time for operators and planners to learn efficient ways of working with the equipment. Scitex's analysis assumes the savings during the first year are 75% of what they will be later; our impression is that the first year savings could be far less.)

At $125 saved per page, how long does it take for the system to pay for itself? That depends on how many pages you push through it. The savings on the first 600 pages (about $75,000) pays for the maintenance contract. The savings on pages beyond 600 pay for the machine itself. Most purchasers would look for at most a 3-year payback period on a piece of equipment like this. According to Scitex's numbers, a three-year payback can be achieved if you run 3200 pages per year. This requires two-shift operation of the equipment.

Obviously, these are rough figures, but they serve to indicate the size of the potential customers for the system. Many of the underlying assumptions in the analysis will have to be altered to fit the case of a given firm. We note that these calculations are very sensitive to variations in assumptions about the saving of labor. If, for example, you can only save four hours of labor per page instead of the postulated five, the results come out quite differently.

New perspectives on quality and efficiency

As noted in the box about our visit to Nashville Electragraphics, we were unable to obtain simple answers about the efficiency of the Scitex system in practice. The somewhat unresolved state of affairs requires further explanation. It has to do with the slow process of learning about the use of the system. There are really two problems: learning what *can* be done with the system and learning what it *makes sense* to do with the system. These are matters to be learned, not just by the operators, but by management, the sales force, and even the customers.

Learning what can be done with the system, and how best to do it, is not a trivial process. A rich repertoire of commands is available, and there are often several ways to accomplish a given result. There is also a certain amount of eye-hand coordination involved in learning to use the stylus, particularly for airbrushing. All of these things take time. NEC's operators got five weeks of on-site training. Roy Luckett, NEC president, compares this to getting a bachelor's and master's degree in one five-week crash course. By the end of it, the operators knew how all the machine's features worked, but they hadn't developed working habits that permitted efficient use. "They could do anything with the machine," says Luckett, "but it might take them 24 hours instead of four." This has improved with time and experience, and it continues to improve even today.

But there is also a deeper learning process in evidence at NEC. It has nothing to do with operator skill. It involves a set of questions about appropriateness of specific work for the Scitex, about the nature of the services NEC has to sell, about what NEC customers should or should not expect, and about the fundamental goals of the color reproduction process. The issues go far beyond the specific circumstances of this company or the specific features of this system.

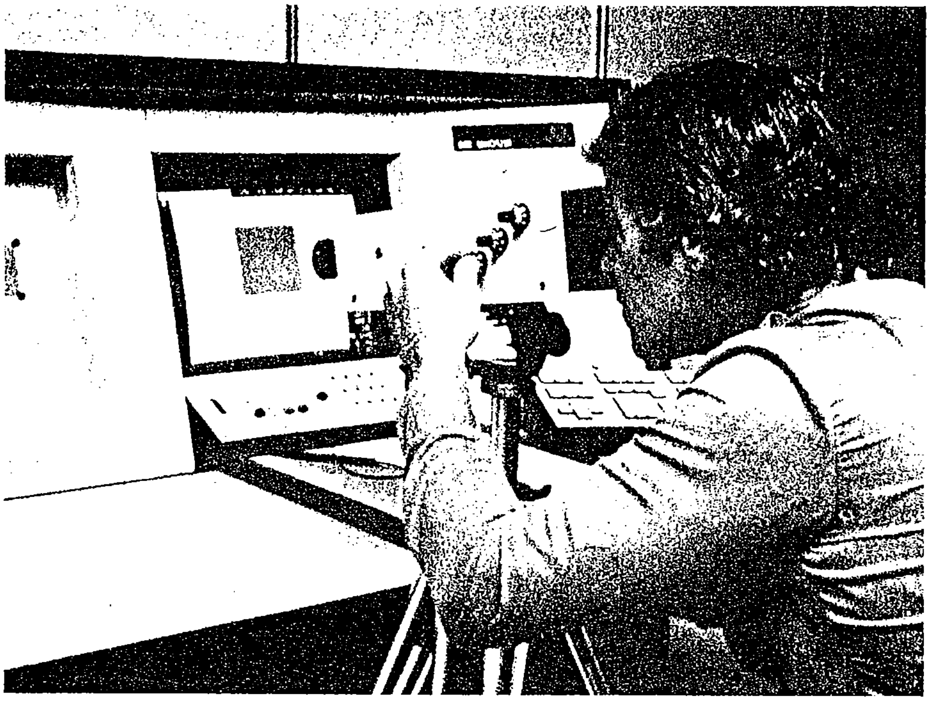
These broader questions are raised because of the capabilities of the equipment itself. In the conventional color process, the objective is to produce the best possible printed product, given the limitations of the art. With the Scitex system it is quite possible to improve upon the art as scanned. Since the tools are there, it is also quite natural to want to make at least some improvements. It is even possible to take in work with obvious deficiencies with the intent of repairing them on the system. But is this desirable? Is it what the customer wants done? How far do you go in correcting poor art? These questions have no answers. Their resolution lies in further learning by all parties.

There were many examples of the impact of these issues at NEC. For example, the day we were visiting, Scitex operator Roger Crain was working on a book cover. He was working

Scitex Corporation Ltd. is headquartered in Herzlia, Israel. All marketing inquiries should be addressed to its American and European offices listed below:

Scitex America Corp.	Scitex Europe S.A.
75-D Wiggins Avenue	304 Avenue Louise
Bedford, Massachusetts 01730	1050 Brussels, Belgium
Telephone (617) 275-5150	Telephone (02) 640-4600

EKC 002002510



Calibration. *A time-consuming but necessary operation is the calibration of the system to the ink and paper combinations for which its output is intended. To achieve calibration, a test image is run through the system and printed. The printed piece is then compared with the screen image and the latter is adjusted for the best possible match. (Perfect agreement is not possible because some printed hues are not reproducible with available CRT phosphors.) A special split-image viewer is used in the calibration process.*

with a rather poor transparency which, without the Scitex system, would probably have resulted in a rather poor finished product. Using the facilities of the system, Crain was able to improve on the image in several ways. An example: the photo was of a woman, and her black hair was too dark to reproduce well. Crain created a mask which outlined every strand of her hair, but no other area of the image. He was then able to adjust color values in the area defined by the mask, leaving the rest of the image unchanged. The Scitex has good facilities for this sort of thing—the process just described took less than ten minutes. It could not have been done with equal precision by any other means, and it would probably have been impractical to attempt even a crudely comparable correction without a system like this. Several corrections of this nature were applied to this photograph before it was deemed ready for output.

There are several important points raised by this example. One is that given this transparency as a starting point, you do *not* get the same thing out of the Scitex process as out of the conventional process. The Scitex version can be significantly better. Another is this: the lower the quality of the starting material, the longer the operator is going to take to get the most out of it. With a really good transparency, this bookjacket job would have taken one-quarter of the time. Another point is this: while cost-justifications can be based on using the system primarily as a device for image assembly, it may not be used that way in practice. In a case like the one just described, image assembly accounted for only a small fraction of the time spent on the job.

It is interesting to note what type of work is presently the most efficient on NEC's Scitex. It is cartoons, diagrams, and similar work consisting of lines bounding regions of flat tint. The material is scanned as black-and-white line art and the colors are filled in on the system. There are almost no corrections to be made (no color corrections at all, of course) and there is a relatively low level of operator craftsmanship and skill required.

Other products

The Response 300 system for the graphic arts is the latest in a series of Scitex machines. Previous machines were aimed at more specialized applications in the textile, packaging and mapmaking areas.

The earliest ancestor of the Response 300 was a machine for producing paper tapes to control knitting machines. The time was the early 1970s and double-knit fabrics were experiencing dramatic growth. The demand for new patterns created a problem, since the method for producing new control tapes was tedious and fraught with opportunities for error.

The problem was brought to the attention of Itek, but after checking the size of the potential market, Itek decided not to pursue the idea. Itek did pass the idea on to newly-formed Scitex. Scitex contained a number of Itek veterans and had acquired some seed money from Itek. (It's interesting to think about what might have happened if Itek had taken on the project and it had developed along the lines that Scitex has taken. Scitex had sales of about $24 million in 1980—up 70% from the year before—while Itek's Graphic Products Division had sales of $83 million, up 18%.)

Scitex produced a successful machine for producing knitting machine control tapes, but sales dwindled as the popularity of knits subsided, and Scitex began looking for other applications requiring a similar approach.

Printed fabrics (plus the related requirements of wallpaper design) was the next application area that Scitex addressed. This area required some significant enhancements over the system for knits. Resolution requirements were much higher. An output plotter was needed, and it had to be very accurate, since fabric printing was a continuous process and the image had to wrap precisely around the printing cylinder with no trace of the seam where the edges joined. Scitex also produces an input scanner for this market.

Scitex's first offerings in the fabric-printing market were intended for use with solid colors and flat tints only. But fabric printing technologies were themselves undergoing rapid improvement in the 70's, and as this occurred Scitex upgraded the capabilities of its machine correspondingly.

With high-resolution output, and the ability to work with tints and shading as well as solid colors, certain areas of the printing industry began to be possible markets. For example, a great deal of package printing does not require halftones or

process color but it does require other operations which the Scitex system handled well: e.g., repeats of the same image on several sides of a package, but at different scales and in different orientations. Map-making, with its requirements for large formats, high precision, and periodic updates, was another application Scitex took on. The map-making system used the same hardware configuration (including scanner) as the textile system, but the software was quite different. In the textile-design system, the ability to repeat a design, using mirroring and rotation as well as horizontal and vertical displacement, is essential. For map-making, on the other hand, the ability to take data from a Mercator projection and convert it to a Lambert projection is important. There are a host of other differences, but it turns out that the same hardware does a good job with both.

Much of the same hardware carries over to the Response 300 system as well. The primary areas of difference are the input scanner (Scitex doesn't make one for the 300), the amount of disk storage (the 300 system requires much more), and the operator's console.

Future trends

A steady stream of enhancements and improvements can be expected from Scitex. We suspect, for example, that it may develop special-purpose hardware for image rotation, a process which at present takes many minutes for an image of significant size. For the immediate future, a key development will be an interface to a typesetting front-end system. This should be available later this year, perhaps in the fall. This interface, coupled with the ability to generate type within the Scitex system, will obviate the need to input type as line art on the scanner. It should also permit more design flexibility: If the format of the type, when combined with the rest of the image elements, turns out to be less than optimal, it should be easy to "reset" the type electronically. Exactly how the interplay between the front-end system and the Scitex system will work is yet to be seen.

Scitex is also working on less expensive (and presumably, less capable) versions of the Response 300.

Scitex's closest competitors at this point are the scanner manufacturers Crosfield and Hell. Both companies now offer systems that address the same set of problems as the Response 300. We hope to cover these systems in subsequent issues. Information International also offers a related product: its system can scan already-separated continuous-tone negatives for transmission to remote printing sites. We reported on that system in Vol. 9, No. 24. Other companies which have shown interest in this area but have not installed any systems that we know of include Coulter and Dainippon Screen.

With more competition, more recognition of its advantages, and further progress in electronics, we see the possibility of significant price reductions over the next few years. This will allow smaller separation houses to get systems, and it may result in some large printers and publishers (whose separation work had previously been sent out) setting up in-house separation operations. A lower-quality, lower-cost device would also be very attractive to large newspapers. For newspapers, the fast turnaround which is possible with this type of system would be a major advantage. Color is an attention-getter, and the ability to use it is an important competitive edge for a newspaper. The time and painstaking accuracy required by conventional processes have been a significant impediment to newspaper use of color.

With the advent of typesetting as an integrated part of these systems, typesetter vendors may find they have competition from an unanticipated quarter. While the impact is sure to be slight in the near term, one has to wonder about the longer-term prognosis. The trend toward the output of fully-made-up pages will continue, and those pages will be increasingly likely to contain color images. It appears that a company like Scitex will be able to supply the total image-handling and output package a lot sooner than will the typesetter vendors. It seems to us considerably easier to add typesetting to a Scitex-type system than to add Scitex-like image handling to a typesetting system.

George A. Alexander

AN UPDATE ON LASER IMAGING FOR THE GRAPHIC ARTS

S. Thomas Dunn, Ph.D*

Abstract: 1982 can be said to be a pivotal year in the evolution of electronic prepress. Many incremental steps were taken since the 1981 TAGA conference that are each directed at the total automation of the prepress production area. During the preceding 12 months, many companies either made new decisions for laser based imaging systems or reinforced previous commitments to laser based imaging. Every day it becomes more apparent that the laser as a digital imaging tool will dominate the progress in electronic prepress, at least for this decade.

The importance of laser imaging to electronic publishing of text, line art, and pictures is now generally accepted. This presentation will provide an overview of the significant developments since the 1981 TAGA meeting, as well as projections for the progress and direction of future developments in laser imaging systems. Topic areas will range from newspaper platemaking to process color imaging.

Introduction

During the past year, new and major commitments to laser imaging were made by DS, PDI, Eikonix, Crosfield and HCM. Interesting is that all of these products are high quality color imaging systems. Most of the lasers are in the blue/green region of the Argon laser, with some initial work on HeCd.

Also, during the year, we have seen the evolution of the split-apart color scanner for independent input and output.

*President, Dunn Technology, Inc.

Further, the Kodak and Agfa-Gevaert acquisitions of Atex and Compugraphics respectively, have placed the consumables suppliers squarely in the electronic pre-press area. With Hoechst (EOCOM), 3M (Autologic joint venture and Comtal), this leaves only duPont (of the large suppliers) in the USA without an electronic hardware prepress venture. Chemco is rumored to be close to making a deal with Dow Jones for their laser platemaker and Polychrome (Dainippon Ink and Chemicals) and Fuji Photo do not appear to have ventures ongoing in electronic prepress, although both are very active in laser compatible materials.

On another front, the electronic page make-up suppliers are, in general, getting into the typesetting business, while at least one of the laser platemaking (facsimile) suppliers is also trying to get into the typesetting business. Thus a field already in trouble (typesetting) faces entries by 6 to 10 new competitors.

Since the last TAGA meeting, low resolution type-setting has begun to penetrate certain printing markets as well as provide useful low cost proofs. These devices are, in general, based on laser imaging.

Thus, from color separations, to typesetting, to platemaking, to proofing, the laser, as a digital imaging device, is finding wide spread acceptance.

Platemaking and Facsimile

Over the past decade, newspapers have been trying to use various laser scanning techniques (Reference 1) to scan paste-ups at one facility and image printing plates at a remote printing plant. The dominant effort has been to use Argon UV lasers and modified Diazo and Photopolymer chemistries. In 1974, these chemistries typically had a sensitivity of greater than 50 milli-jouels per square centimeter, while the laser scanners being developed delivered about 5-10 millijoules per square centimeter. As plate manufacturers improved the sensitivity of their printing plate coatings, the resultant press life (run length) and shelf life (after coating) did not meet the requirements of the medium to large size newspapers. Some 10 newspapers in the US and Canada have attempted to transmit to UV receivers

imaging printing plates . Only three of these newspapers are still attempting this at this time, and the current results are not all that encouraging. Problems remain in press life (approximately 50,000 impressions), shelf life (hours to days) and in reliability and maintainability of the UV laser tube (rebuild after 500 to 1500 hours).

In the same vein, the standalone UV platemakers have had similar problems. Two medium size U.S. newspapers are continuing with standalone UV platemakers; here the main problem is laser tube life (since press run lengths are shorter).

During 1981, one large U.S. newspaper committed to electrophotographic printing plates at the receive site, and The Wall Street Journal has an 8 year old development program with electrophotographic printing plates at the receive site. Between these two efforts, there are some 18 receiver units installed in this mode of operation. The main advantage of this approach is the use of low power, visible (blue/green) lines of the Argon laser (same laser as used in color scanners) resulting in excellent laser performance. The main disadvantage of this approach is the cost of the photoconductive printing plates, which are 2 to 3 times as expensive as conventional newspaper wipe-on UV Diazo based printing plates.

However, it is our projection that electrophotographic platemaking will be the dominant direction for future facsimile and CPU-to-Plate applications for newspapers (Reference 2).

Already there are a variety of vendors providing (developing) electrophotographically based platemaking systems (Figure 1).

Toner Use	Company	Type of Plate	Type of Intermediate	System	Status
Photo Mask	Nippon Paint/NAPP	Relief	Reusable	Camera	Dev.
Etchant Mask	Fuji Chemical	Coated Offset	Reusable	Camera	Dev.
Etchant Mask	Konishiroku	? Offset	?	?	Dev.
Etchant Mask	Chemco	Presensitized Offset	None	Camera	Field Trials
Etchant Mask	Chemco/Dow Jones	Presensitized Offset	None	Laser	Installed
?	Howson Algraphy	?	?	?	Dev.
Etchant Mask	Azoplate: Elfasol	Presensitized Offset	None	Camera	Installed
Etchant Mask	EOCOM/Muirhead: Elfasol	Presensitized Offset	None	Laser	Installed
Etchant Mask	Mitrok	Presensitized Offset	None	Camera	Field Trials
Etchant Mask	Polychrome	Presensitized Offset	None	Camera	Dev.
Print With	3M - Pyrofax	Toner on Aluminum	Partly Reusable/ Reclaimable	Camera	Mature
Print With	Agfa-Gevaert	Toner on Aluminum	Reuseable	Camera	Field Trials

Figure 1: Electrophotographic Developments for Newspaper Printing Plates

From Figure 1 it is important to take notice of those systems that utilized reusable intermediates and toner on aluminum for printing. These systems are limited to 3M-Pyrofax and the recently announced Agfa-Gevaert Electroplater. In fact, the Electroplater goes the furthest in providing the requisite overall lowest cost approach. This statement of cost effectiveness depends on the actual rental charge made by Agfa as well as the charge made for each image. Agfa does not currently plan to sell the hardware.

Figure 2 is a block diagram of the Electroplater. Without going into full detail here,

3: is copy board

2: is camera lens

1: reusable photo conductor

4-5-6-7-18-17-16: Is the path of the photo conductor running on air bearing slides where it is charged, cleaned etc. in the return direction, and toned, cleaned, and off contact transfer of toner to wipe-on offset aluminum at the top drum 8 in the forward direction.

13: is facilities for 3 different size plates (up to

25 x 36 image area)

14-15-8-9-10-12-11: is the progress of the aluminum plate which is toned, fused, gummed and dispensed.

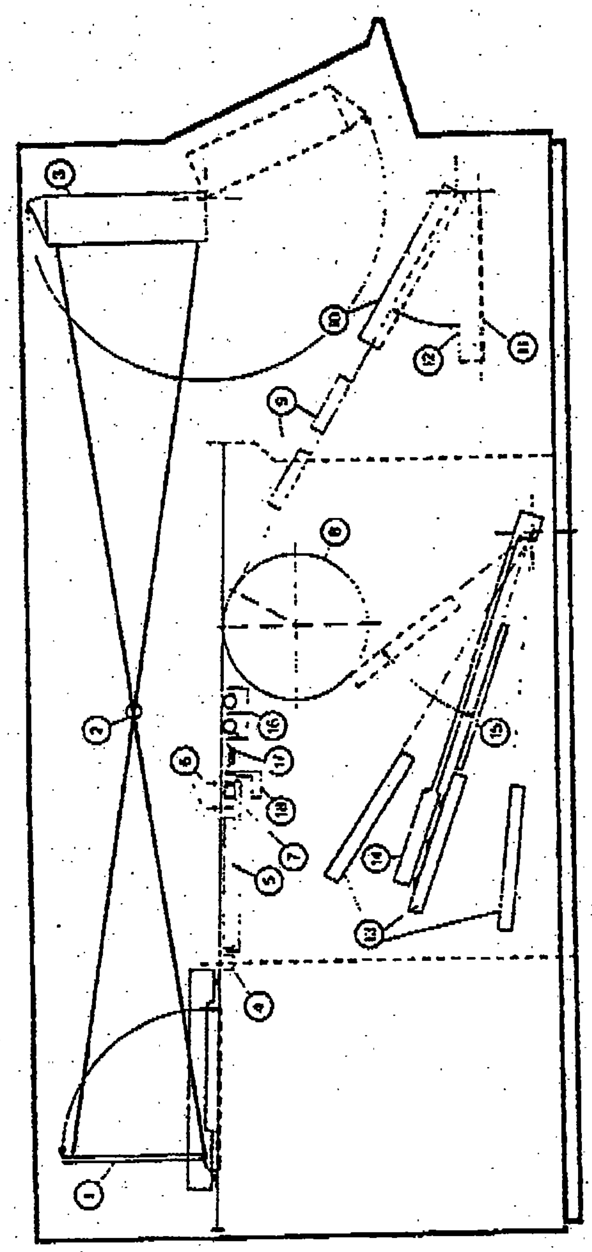


Figure 2: Agfa-Gevaert Electroplater

Thus, with the Electroplater, one should approach wipe-on offset printing plate costs, and with a stated throughput of 200 printing plates per hour, this system should prove viable for medium to large size newspapers. It should be noted that all of the printing plates given in Figure 1 are sensitive to either the Argon, HeCd or HeNe low power (cost) lasers. Further, it is probable that several of these photoconductors can readily be sensitized for use with short wavelength semiconductor lasers.

Two thermal technologies exist that may compete favorably with the electrophotographic techniques (Figure 3).

Technology	Type of Plate	Type of Intermediate	System	Status
Chromium Dioxide	Offset	Reusable	Laser	?
Lasermask	Offset	Non-Reusable	Laser	Installed

Figure 3: Thermal Technologies for Newspaper Printing Plates

In the Chromium Dioxide system, the Chromium Dioxide is reusable, as with the photoconductor in the Electroplater. This technology is currently in use for the production of printed circuit boards. Magnetic charge is used to transfer toner to the aluminum printing plate. Again plate prices with this technology could approach wipe-on offset pricing. The Lasermask® carries the toner on a plastic substrate; the toner is transferred by laser heating to the aluminum plate. With this technology, a lasermask is required for each printing plate to be made. It should be pointed out that the Lasermask® , after imaging leaves a plastic sheet which can then be used as a negative for conventional UV exposure of printing plates.

From Reference 2 we have projected system-to-typesetter facsimile as the means to optimize required bandwidth and achieve optimum quality at reduced commu-

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nications costs. This remains true and is utilized by the national news magazines with their Triple-I systems.

However, newspapers are still precluded from this path due to lack of availability of the full page. In most cases, full page text is not available, and in the U.S. only one newspaper has digital news pictures available , and no one has found a satisfactory solution to the provided prescreened display advertisement.

One final issue concerns those laser imaging systems that go to plate-ready film; waiting for the correct solution to digital platemaking. Here, several products use the HeNe laser, while others use low power Argon and HeCd. The trade-offs are straight forward. Laser costs: the Argon is about twice the cost of the HeCd which in turn is some 6 times the cost of HeNe. On the other hand, red sensitive film is from 15 percent to 50 percent more expensive than equivalent blue/green sensitive film. This film pricing situation is probably not permanent, as red films do not appear to be substantially more expensive to manufacture. The current pricing differential more likely reflects limited competition and limited volume. One other difference between the two regions is that blue/green lasers deliver more power than the HeNe laser, and the films are typically more sensitive in the blue/green than in the red region.

Thus, one can expect to see Argon/HeCd lasers in the more expensive, higher productivity systems and HeNe lasers in lower cost, lower productivity systems.

Regarding laser platemaking and facsimile, the following Figures 4 through 9 provide information on the market and are self explanatory. (Note this does not cover the external drum facsimile provided by Muirhead, Rapicom, Matsushita, and NEC such as the Rapicom/Muirhead order with U.S. Today - Gannett's evolving national newspaper.)

Customer	Senders	Receivers	Senders/Receivers	Application
New York Times (FL)			2	Facsimile
St. Paul	2	2		Facsimile
Gotesborgs Posten	1	1		Facsimile
Osaka Yamatoya			1	Demonstrator
Totals:	3	3	3 = 9	

Figure 4: Unit Orders for LogEscan - 1981

Customer	Senders	Receivers	Application
Baton Rouge	2	2	Facsimile/Film
Asbury Park	1	1	Facsimile/Film
La Prensa (Mexico)	1	1	Inplant/Film
Autologic		1	
New York Times (LIT) Management System for LogEscan			
Totals:	4	4 = 8	

Figure 5: Unit Orders for Muirhead - 1981

Figure 5: Unit Orders for Muirhead - 1981

Customer	Senders	Receivers	Senders/Receivers	Application
Phoenix Gazette			4	Two Units to Film; Two Units to UV Plate; Facsimile
Reno			2	Inplant Facsimile to Plates
Toronto		4		Facsimile, Film
San Francisco			4	Facsimile, Film
Totals:	0	4	10 = 14	

Figure 6: Unit Orders for EOCOM - 1981

Company	U.S.A.	International	Total
EOCOM	10 (43%)	4 (44%)	14 (44%)
LogEscan	6 (26%)	3 (33%)	9 (28%)
Muirhead	7 (31%)	2 (23%)	9 (28%)
Totals:	23	9	32

Figure 7: Unit Orders - 1981

	1978			1979			1980			1981			4 Year Total		
	US	Int'l	Total	US	Int'l	Total	US	Int'l	Total	US	Int'l	Total	US	Int'l	Total
EOCOM	20	8	28	18	19	37	2	9	11	10	4	14	50	40	90
LogEscan	10	2	12	15	0	15	7	2	9	6	3	9	38	7	45
Muirhead	2	0	2	0	2	2	14	2	16	7	2	9	23	6	29
Totals:	32	10	42	33	21	54	23	13	36	23	9	32	111	53	164

Figure 8: Total Unit Orders - 1978-1981 (Exclusive of Dow Jones and Japan)

Company	Units	Customers
EOCOM	47 (44%)	13
LogEscan	41 (39%)	8
Muirhead	18 (17%)	4
Totals:	106	25

Figure 9: Market Share for U.S. Newspapers (March-1982)

At this time there are estimated to be some 193 systems, with the following major delineating characteristics (here the 10 units returned in 1981 (by our counting system) have been factored out):

- 80% for facsimile (up from 73% as of January 1, 1980):

  86 units with sending capability and 112 units with receiving capability (for a total of 155 units)

  49% of the exposures to film

  20% of the exposures to UV printing plates

  61% market share for EOCOM (down from 64%)

- 19% for non-facsimile (down from 27%):

  38% of these for UV exposure (down from 51%)

- 85% of systems ordered are estimated to be operational

What's the matter?

For the past 24 months we have been projecting the downturn in the market.

- In January of 1981 we projected 1981 to be the same as 1980, which came about.

- Further, EOCOM still does not have a satisfactory UV laser/printing plate combination for over 50,000 - 75,000 impressions.

- LogEscan has not made substantial inroads in the USA with the direct-to-plate version of the lasermask

- Muirhead's Chicago Tribune installation is only just coming online with the Elfasol plate.

The net sum of it is that the technology has become satisfactory for facsimile use (intra and interplant) to film. 1982 will likely follow the patterns

of 1980 and 1981, with no significant inroads in stand-alone platemaking, or direct platemaking at the receive facsimile site.

Pagination with text, halftones, and line art in place, will be a new driving force for the technology, but this is not likely to occur in any substantial form before late 1983 and/or 1984.

The development of this pagination application is primarily paced by solutions to:

Picture Processing
Provided Display Ads

Color Scanning

In this market, developments are keeping pace with our 1980 projections (Reference 1). The trends are very clear and well focused around electronic color page make-up systems.

- Split-Apart Scanner: During the past year, Crosfield has evolved the 530/540 split scanner into the 640 series scanners to support their page make-up system. DS upgraded its split-apart scanner. HCM announced a standalone output record, Scitex upgraded its ELP output recorders to the ERAY output with 4 beams in place of the previous one-beam system to improve output speed.

- Electronic Halftone: Crosfield announced electronic halftones for 2 of 3 output recorders of the 640-series, DS announced electronic halftones (with 23 by 23 matrix) for its 708 and 808 scanners, and HCM brought out the DC350 electronic halftones at conventional angles.

- Argon Lasers: Following HCM's decade ago decision, Crosfield, Scitex, PDI and DS all now offer the Argon laser for output. The DS decision was a shift from HeNe, partly caused by the high red film prices discussed above.

- HeCd Lasers: Eikonix is at least one (of several) of the color scanners manufacturers who are seriously evaluating the HeCd laser as a lower cost alternate to the Argon laser.

- Laser: With exception of Linotype Paul, all scanner manufacturers are including lasers and electronic dot generation in their premium scanners. Linotype Paul is rumored to be working on a contact screen Argon laser output.

- Digital Color Proof: HCM is to show a Direct Digital Color Proofing System at DRUPA. Here, 3 laser lines are used to image Kodak R-19, R-14, and other color papers. The output media for the Digital Color Proofer has not been announced. This $375,000 device will probably find its best use within the gravure industry, where no film is required in those electronic systems driving Helioklischographs or laser gravure. Crosfield and Scitex are rumored to be close behind HCM in digital color proofing. Look for a future trend to electrophotographic-based digital color proofing systems. One example is KC film, but others should surface.

- Large Format Output: HCM, Scitex, Crosfield, and DS now all have standalone output drum capacities to cope with at least an 8-page imposition, enabling the outputting of a fully plate-ready signature.

- Flatfield: The developing Eikonix technology is based on a flatfield input scanner using linear arrays.